WATERSHED IMPLEMENTATION PLAN

BAYOU VERRET, BAYOU CHEVREUIL, BAYOU CITAMON AND GRAND BAYOU WATERSHED

SUBSEGMENT 020101

Nonpoint Source Unit

EXECUTIVE SUMMARY

The Bayou Verret, Bayou Chevreuil, Bayou Citamon and Grand Bayou water body subsegment is located in southeast Louisiana and includes LDEQ Water Quality subsegment 020101. The subsegment has been cited as impaired by LDEQ on its 303(d) List for several years. The watershed has not been supporting its designated use of Fish and Wildlife Propagation. Suspected causes of impairment include low levels of dissolved oxygen and elevated nitrogen and phosphorus. The watershed is still remote, sparsely settled, and covered with extensive forest. The major impacts are agricultural runoff from sugarcane fields and extensive hydromodification.

A 2004 TMDL addressed biochemical oxygen-demanding pollutants for the watershed (organic enrichment/low DO and excessive nutrients). It was found that man made sources of pollution would need to be reduced by 100% in summer and 98% in winter in order to meet the D.O. standard of 5.0 mg/L. Natural background sources would have to be reduced by 46% in the summer. There is some evidence that the existing DO standard of 5.0 mg/L may not be appropriate for summer in this subsegment.

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1.0 INTRODUCTION

Section 303(d) of the federal Clean Water Act (CWA) requires that each state identify those waters within its boundaries not meeting water quality standards. The CWA also requires that states develop Total Maximum Daily Loads (TMDLs) for water bodies determined to be impaired. A TMDL is a model that determines the amount of a pollutant a water body can assimilate without violating water quality standards. The TMDL breaks out the total load between known point sources (such as waste water treatment plants) and nonpoint sources (such as agricultural runoff). Also included is a margin of safety to accommodate data uncertainties and model errors.

The Bayou Verret, Bayou Chevreuil, Bayou Citamon and Grand Bayou subsegment (020101) has been cited by LDEQ for failure to maintain its standard for Fish and Wildlife Propagation (FWP). Suspected causes of impairment include low dissolved oxygen and excessive nutrient concentrations. These were the focus of the 2004 TMDL.

Propagation of Fish and Wildlife refers to the protection of aquatic habitat, food, reproduction and travel corridors. A main criterion in determination of use attainment for FWP is the concentration of dissolved oxygen (D.O.). D.O. levels of 5 mg/L are the standard to support FWP. (This is also the year-round criterion for D.O. in this water body subsegment.)

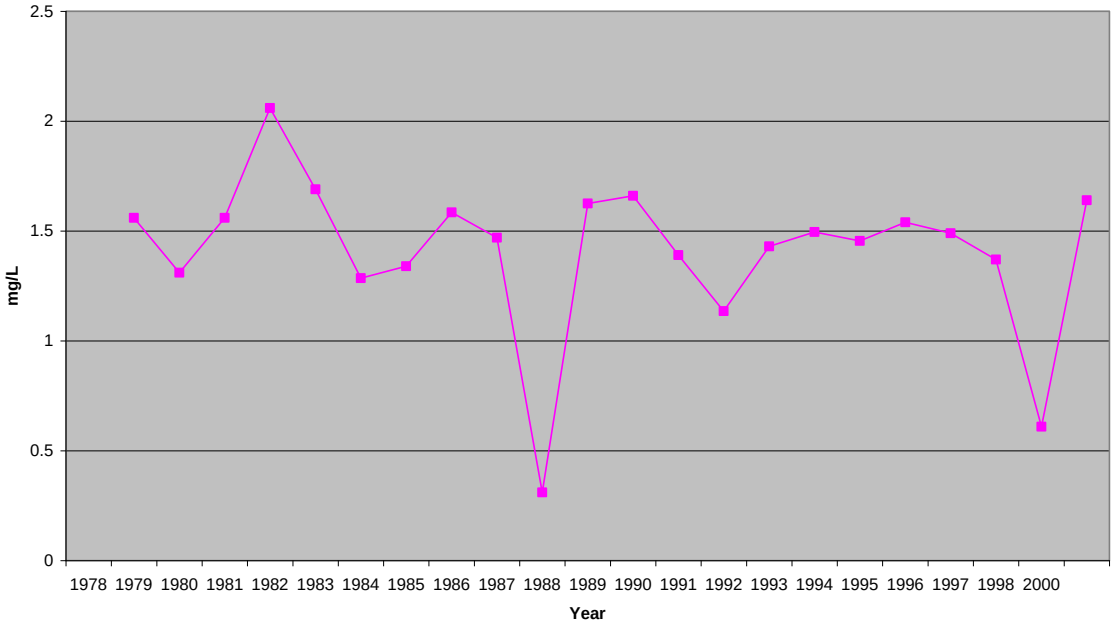
At present there are no specific numeric criteria for nutrients in Louisiana. However, the State currently has a narrative standard that states “The naturally occurring range of nitrogen-phosphorus ratios shall be maintained…Nutrient concentrations that produce aquatic growth to the extent that it creates a public nuisance or interferes with designated water uses shall not be added to any surface waters.”

LDEQ has developed nutrient ranges for the different ecoregions of the state. This subsegment lies within the Lower Mississippi Alluvial Plain. Bayou Verret, Bayou Chevreuil, Bayou Citamon and Grand Bayou subsegment does frequently exceed the median for its ecoregion (see graphs following).

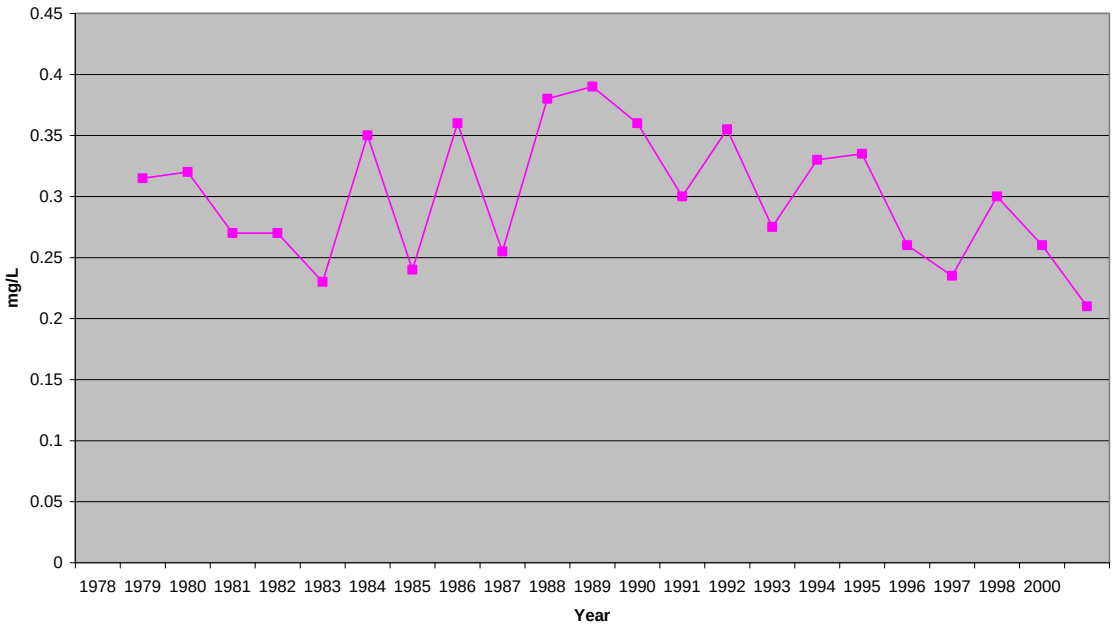
1.1 Eco-Region Description

Subsegment 020101 is in the Lower Mississippi Alluvial Plain ecoregion, as seen at left. Ecoregions denote areas of similar ecological characteristics. Alluvial plains are lowland areas adjacent to major rivers, which receive periodic flooding. Significant deposits of silt and clay material are suspended in these floodwaters. Bottomland hardwood forests and cypress swamps are the dominant natural plant communities in the Mississippi River Alluvial Plain. These forested wetlands are able to survive extended periods of flooding and benefit from the rich sediment deposited at each flood.

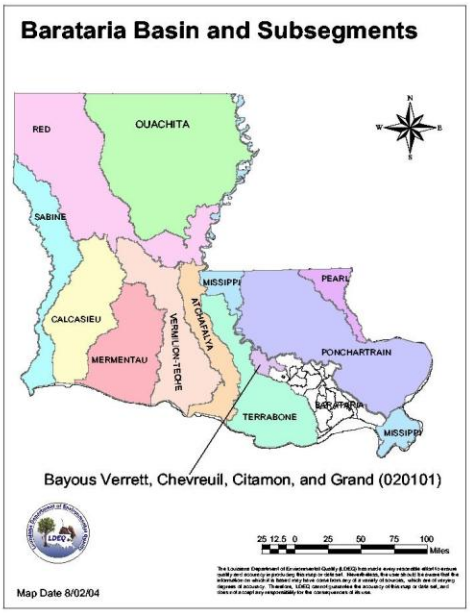
Median NO2 + NO3 + TKN by year in subsegment 020101 (site 0084) is higher than usual for the Ecoregion.
(In the Lower Mississippi Alluvial Plain: Median Total Nitrogen = 1.21 mg/L)



Median Total Phosphorus in subsegment 020101 (site 0084) is higher than usual for the Ecoregion.
(In the Lower Mississippi Alluvial Plain: Median Total Phosphorus = 0.137 mg/L)



1.2 Basin Description



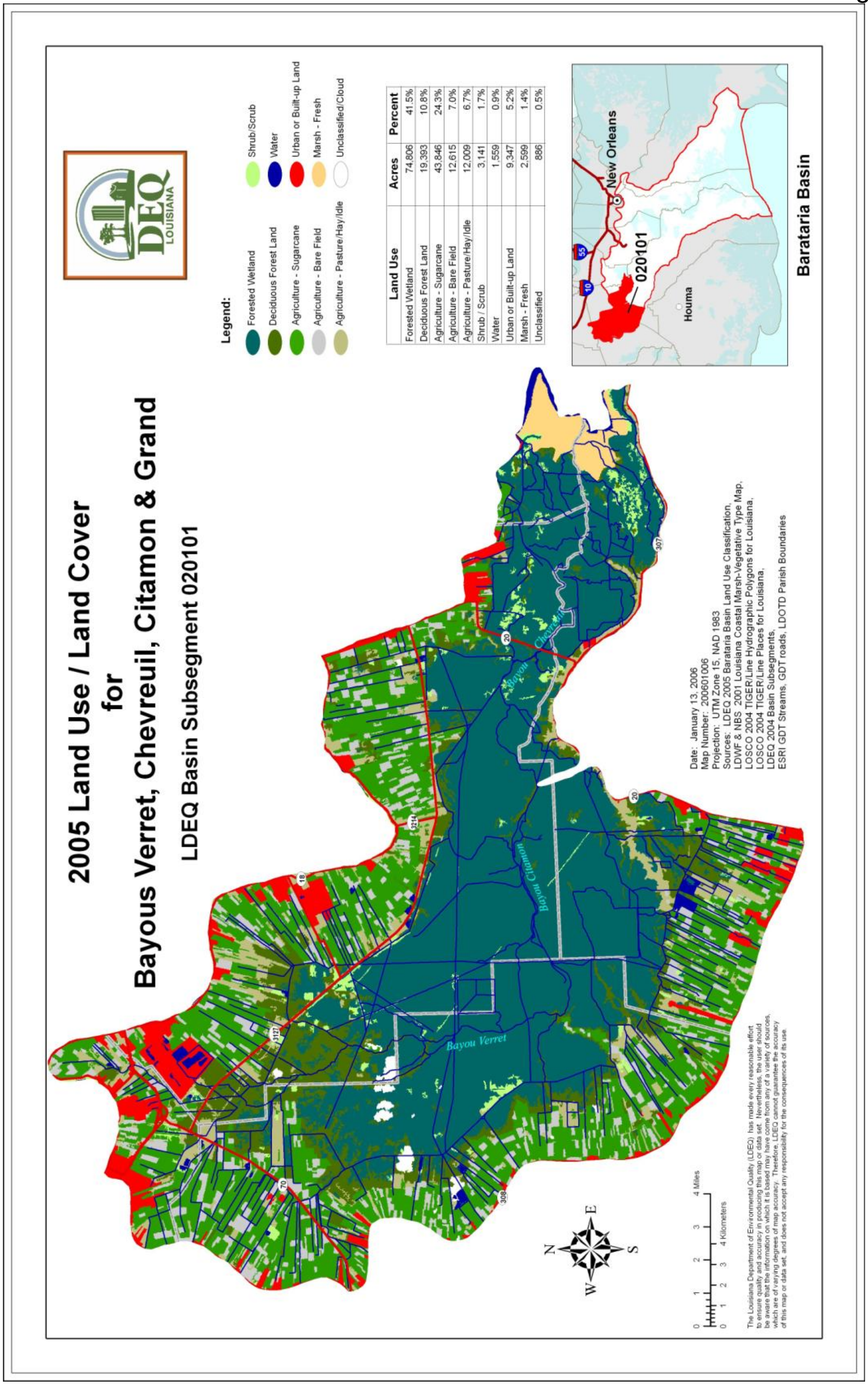
Subsegment 020101 is located in the northwest portion of the Barataria Basin, as seen at left. The Barataria Basin lies in the eastern coastal region of the state. It is bounded on the north and east by the lower Mississippi River, on the west by Bayou Lafourche, and on the south by the Gulf of Mexico. It is separated from the Gulf by a chain of barrier islands. It consists largely of wooded lowlands and fresh to brackish marshes. Wetland loss and coastal erosion are significant problems in the Barataria Basin.

1.3 Watershed Description

The Bayou Verret, Bayou Chevreuil, Bayou Citamon and Grand Bayou Watershed (subsegment 020101) is located in southern Louisiana, west of New Orleans. Parts of St. James, Ascension, Assumption, Lafourche and St. John the Baptist Parishes fall within Subsegment 020101. It is bounded on the north by the Mississippi River and on the west/southwest by the east bank of Bayou Lafourche. 020101 includes some of the highest elevations in the Barataria Basin. The high ground consists of meander belts (roughly the perimeter of the subsegment) of the Mississippi River and Bayou Lafourche and the low ground are inland swamps (interior of subsegment).

The subsegment includes three main bayous: Bayou Verret, Bayou Citamon and Bayou Chevreuil. These three water bodies provide the main drainage for the area. There are also several other significant canals and bayous, particularly Baker Canal and St. James Canal. (Although Grand Bayou is included in the name of the subsegment, it is actually located in an adjacent subsegment to the south. Grand Bayou meets Bayou Citamon at an edge of the subsegment boundary.)

The watershed originates near Donaldsonville, Louisiana in Ascension Parish and flows in a southeasterly/easterly direction for about 35 miles. The watershed mostly drains into Lac Des Allemands, a large lake on the eastern side of the subsegment, though some overflow may spill into Grand Bayou (an adjacent subsegment). Like Subsegment


2005 Land Use / Land Cover
for
Bayous Verret, Chevreuil, Citamon & Grand
LDEQ Basin Subsegment 020101
DEQ
LOUISIANA
Legend:
Forested Wetland
Deciduous Forest Land
Agriculture - Sugarcane
Agriculture - Bare Field
Agriculture - Pasture/Hay/Idle
Shrub/Scrub
Water
Urban or Built-up Land
Marsh - Fresh
Unclassified/Cloud
Land Use | Acres | Percent
Forested Wetland | 74,806 | 41.5%
Deciduous Forest Land | 19,393 | 10.8%
Agriculture - Sugarcane | 43,846 | 24.3%
Agriculture - Bare Field | 12,615 | 7.0%
Agriculture - Pasture/Hay/Idle | 12,009 | 6.7%
Shrub / Scrub | 3,141 | 1.7%
Water | 1,559 | 0.9%
Urban or Built-up Land | 9,347 | 5.2%
Marsh - Fresh | 2,599 | 1.4%
Unclassified | 886 | 0.5%
New Orleans
020101
Houma
Barataria Basin
Bayou Verret
Bayou Citamon
Bayou Chevreuil
Date: January 13, 2006
Map Number: 200601006
Projection: UTM Zone 15, NAD 1983
Sources: LDEQ 2005 Barataria Basin Land Use Classification,
LDWF & NBS 2001 Louisiana Coastal Marsh-Vegetative Type Map,
LOSCO 2004 TIGER/Line Hydrographic Polygons for Louisiana,
LOSCO 2004 TIGER/Line Places for Louisiana,
LDEQ 2004 Basin Subsegments,
ESRI GDT Streams, GDT roads, LDOTD Parish Boundaries
N
S
E
W
0 1 2 3 4 Miles
0 1 2 3 4 Kilometers
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort
to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should
be aware that the information on which it is based may have come from any of a variety of sources,
which are of varying degrees of map accuracy. Therefore, LDEQ cannot guarantee the accuracy
of this map or data set, and does not accept any responsibility for the consequences of its use.

020101, Grand Bayou also empties into Lac des Allemands, which eventually discharges into the Gulf of Mexico.

Much of the subsegment is remote and there are only a few small settlements. There are few roadways. Paved highways run along Bayou Lafourche to the west and the Mississippi River to the north, the borders of the watershed. There is some urban activity centered here as well. Much of the subsegment is only accessible by boat. There is an extensive network of pipelines throughout this area as well as oil and natural gas wells. Crawfish and sugarcane are the principal crops grown in the subsegment. The forested areas are mostly covered by bottomland hardwoods on the natural levees and bayous and cypress swamp in the lowlands. A good amount of the natural levee has been turned over to agricultural and urban uses. There is not a great deal of open marsh in this subsegment.

2.0 WATER QUALITY ANALYSIS

Water quality standards are developed to support each different type of designated use. The tables below depict the designated uses and standards for 020101.

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially	Not Supporting
Primary Contact Recreation (PCR)	Fecal coliform[1]	0-25% do not meet criteria	-	>25% do not meet criteria
	Temperature	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
Secondary Contact Recreation (SCR)	Fecal coliform[1]	0-25% do not meet criteria	-	>25 % do not meet criteria
Fish and Wildlife Propagation (FWP)	Dissolved oxygen[2]	0-10% do not meet minimum of 3.0 ppm and median > criteria of 5.0 ppm	-	>10% do not meet minimum of 3.0 ppm or median < criteria of 5.0 ppm
	Dissolved oxygen[3]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
	Temperature, pH, chloride, sulfate, TDS	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
Agriculture	None	-	-	-

1. For most water bodies, criteria is as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL (see LAC 33:IX.1123).
2. Water bodies without a special study to establish specific criteria for D.O.
3. Water bodies for which a special study has been conducted to establish criteria for D.O.

Designated Uses for the Water body subsegment

Subsegment Number	020101
Water body Description	Bayou Verret, Bayou Chevreuil, Bayou Citamon and Grand Bayou
Designated Uses	A, B, C, F
Criteria:	
Chloride	65 mg/L
Sulfate	50 mg/L
DO	5.0 mg/L
pH	6.0 – 8.5
Temperature	32 °C
TDS	430 mg/L

DESIGNATED USES: A- primary contact recreation; B- secondary contact recreation; C- propagation of fish and wildlife; F- agriculture

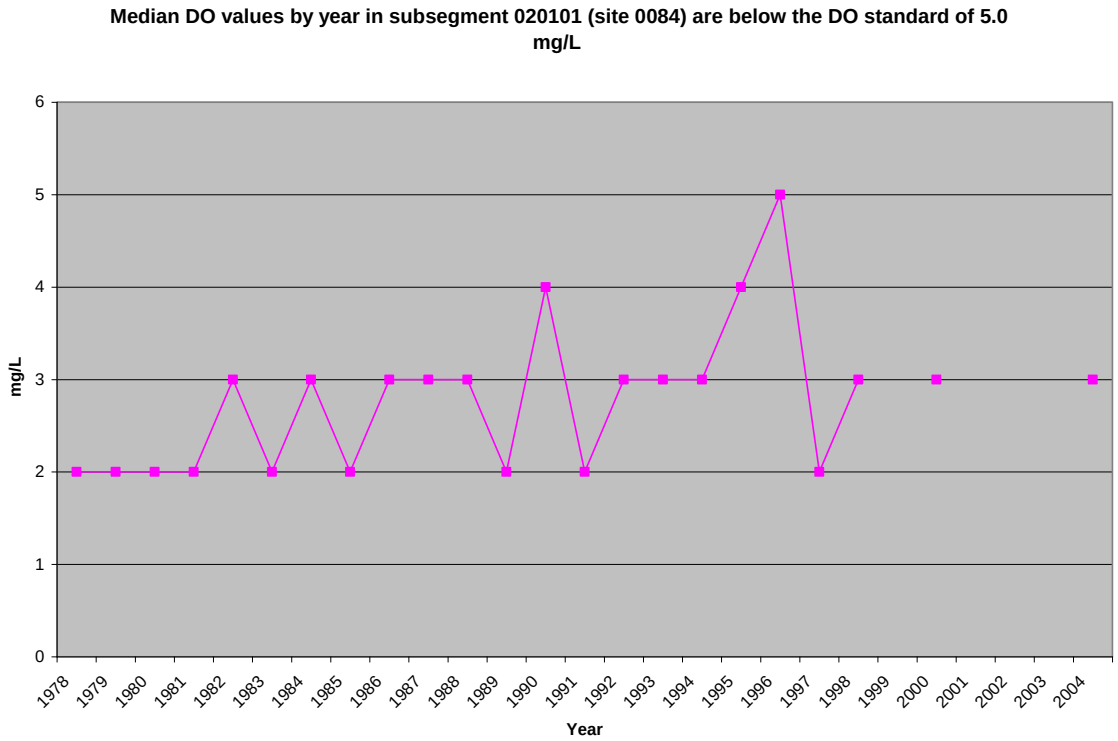
Numerical Criteria

2.1 Water Quality Test Results

Historically there were two monitoring sites in the watershed although only one is maintained today. Dissolved oxygen levels are quite low in the subsegment while nitrogen and phosphorus are elevated.

Station	Description of the Monitoring Location	Period of Record
0084	Bayou Chevreuil at bridge on LA 20, 6 miles east of Chegby and 7 miles south of Vacherie	1978 - 2004
0408	Bayou L'Onion at bridge on LA 304, 1.2 miles west of Chegby and 6 miles north of Thibodaux	1963 - 1974

Sampling Stations in the Subsegment



3.0 TMDL FINDING AND RECOMMENDATIONS

The purpose of a TMDL is to determine the amount of a pollutant that a waterbody can assimilate without exceeding the water quality standard for that pollutant. A TMDL also establishes the load reduction that may be necessary to meet a given standard in a waterbody. A TMDL is the sum of the waste load allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The WLA is the load allocated to point sources/discrete dischargers and the LA is the load allocated to nonpoint sources/runoff. The MOS is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

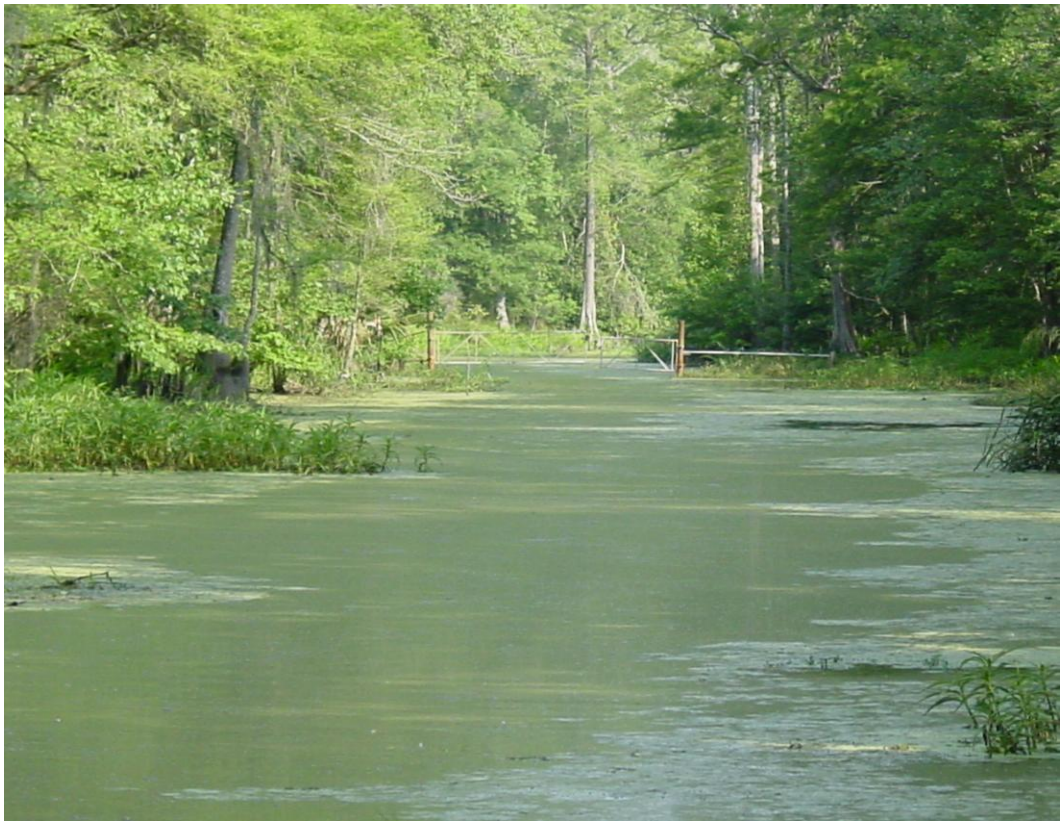
A 2004 TMDL by FTN Associates Ltd. addressed biochemical oxygen-demanding pollutants for the watershed. This included the organic enrichment/low DO impairment and the nutrient impairment. In order to meet the water quality standard for DO of 5.0 mg/L, it was found that man made sources would need to be reduced by 100% in summer and 98% in winter. Natural background sources would have to be reduced by 46% in the summer. Based upon the model, there was some evidence that the existing DO standard of 5.0 mg/L may not be appropriate for summer.

The watershed was divided into eight reaches (see table below) in order to capture water quality variations throughout its extent. The main stem of the model includes Baker Canal East, Bayou Citamon, and Bayou Chevreuil. Part of Bayou Verret is modeled as a branch of the main stem. The reaches run from west to east. Reaches 1 and 2 were assigned as “headwaters” by the TMDL modelers. These reaches

correspond to Baker Canal East and Bayou Verret, respectively. Baker Canal East is a hydro-modified reach at the western extent of the model. It runs along the same alignment as Bayou Citamon/Bayou Chevreuil in the network of waterways that comprise this subsegment. Bayou Verret is the only tributary that was included in the model. It enters the main stem from the north. Reaches 4, 5, and part of 6 are known as Bayou Citamon. The modeled water body continues easterly and becomes known as Bayou Chevreuil at about the midpoint of Reach 6 and continues through Reaches 7 and 8. Eventually the water course empties into Lac des Allemands at the end of Reach 8.

Reach Number	Reach Description	Calibration Model Reach Length (km)	Ending River Kilometer of Reach
1	Baker Canal East	3.1	35.2
2	Bayou Verret	3.2	0
3	Bayou Citamon	0.5	34.7
4	Bayou Citamon	6.2	28.5
5	Bayou Citamon	5.7	22.8
6	Bayou Chevreuil	6.5	16.3
7	Bayou Chevreuil	6.5	9.8
8	Bayou Chevreuil	9.8	0.0

Reach Descriptions from the TMDL model



This north-facing view of the sole modeled tributary, Bayou Verret (Reach 2), was taken from the main stem of Bayou Citamon. A gate, probably erected by sportsmen, restricts access.

The greatest *total* oxygen demand, by reach, is seen in Reaches 1 and 7 (see graphs following). When the break-out by reach of the *partitioned* oxygen demand is viewed, it is seen that the majority of this may be attributed to headwaters and tributaries. The headwaters and tributaries are comprised of loads associated with inflow from the designated headwaters and un-modeled tributaries. [It does include carbonaceous biochemical oxygen demand (CBOD), organic nitrogen, and ammonia nitrogen.] The headwaters and tributaries load is not expected to be associated with re-suspended bottom sediments, the benthic load, permitted point sources, or ground water.

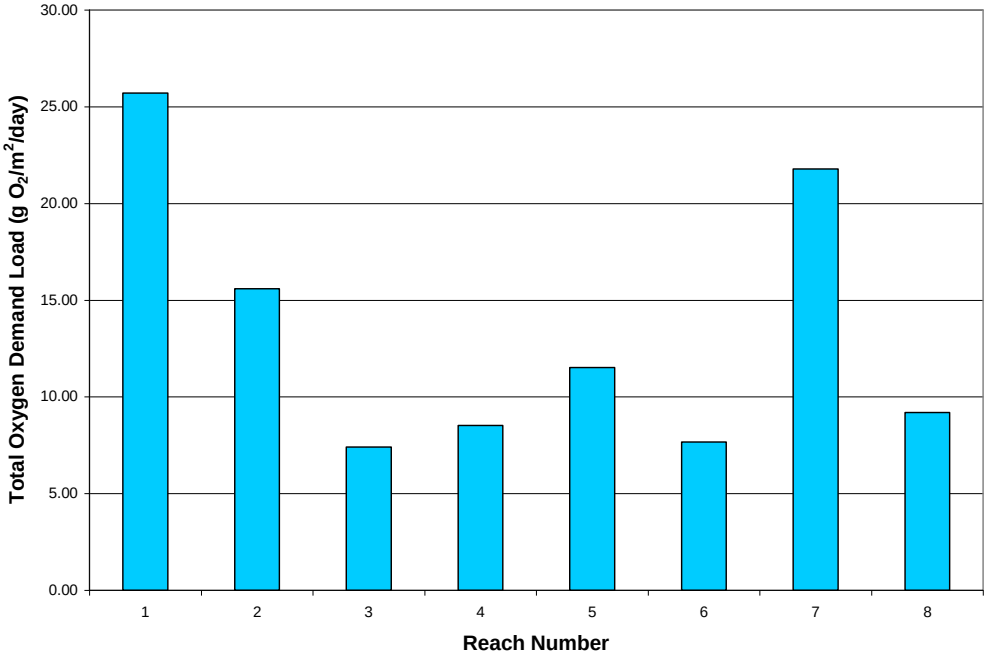
Baker Canal South appears stagnant and impaired. This channel feeds the headwaters of the TMDL model, Baker Canal East.

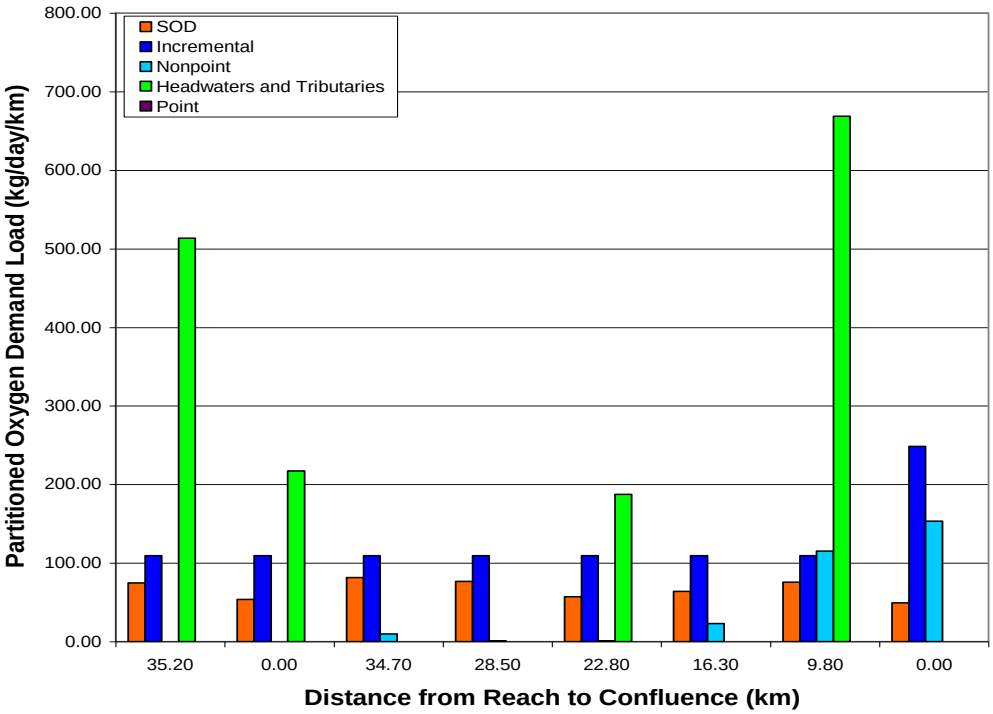
Because the entire subsegment is a series of interconnected waterways, all reaches of the modeled main stem exchange some flow with tributaries. However, both Reach 1 and Reach 7 are connected to significant canals that were not included in the model. These additional waterways may or may not impact water quality on the main stem.

Reach 1 (Baker Canal East) originates where it runs perpendicular off of Baker Canal North/South. Baker Canal North and Baker Canal South run parallel to Bayou Lafourche along the western boundary of the subsegment. This hydromodified waterway receives runoff from the urban areas and sugarcane fields that line the east bank of Bayou Lafourche. Reach 7 receives flow from Dredge Boat Canal and Upper St. James Canal. Both of these receive runoff from urban areas and sugarcane fields as well.

The finding that headwaters and tributaries may contribute significantly to water quality problems might indicate that a significant rise in dissolved oxygen levels is not realistic without further study. There may be many reasons for this ambiguity. Some of these are the little to no flow in the streams of the subsegment, the lack of geographical relief throughout the watershed, and, perhaps primarily, the massive hydromodification efforts that go back to the turn of the last century.

(When developing the graphs below, data from point sources were not included. Because the subsegment's point source dischargers were located at sufficient distance from the modeled water bodies, they were not believed to have an impact. Permitted dischargers were not included in the TMDL model. This does not preclude the possibility that a marginal effect may be present and further investigation may be warranted.)





SOD	Rate of oxygen consumption by the bottom sediment
Incremental	Associated with groundwater inflows
Nonpoint	Sum of the loads not associated with a flow; simulates loads from the stream bed benthic load that have been re-suspended
Headwaters and tributaries	Associated with inflow from the headwaters and unmodeled tributaries
Point	Load from fixed facilities that discharge directly into water body

4.0 SOILS

All soils are of recent age and evolved in climatic conditions much like today. Soils in the lower portions of the subsegment are mostly level and clayey. They are somewhat poorly drained to nearly continuously flooded. These soils are useful for wildlife habitat and recreation.

On the higher, natural levees, loamy soils may be found. These soils are poorly drained, but may be free from flooding, and are commonly used for sugarcane production. They also support some urban development.

5.0 WATERSHED LAND USE ACTIVITIES

Land Use Type	Percent of Total Area
Wetland Forest/Deciduous	51.7
Agriculture/Cropland/Grassland	36.8
Water	4.1
Vegetated Urban	4.0
Freshwater Marsh	2.1
Wetland Scrub/Shrub Deciduous	0.6
Upland Barren	0.3
Upland Forest/Mixed	0.2
Non-vegetated urban	0.1
Wetland Scrub/Shrub Evergreen	0.1
Saline Marsh	0.0
TOTAL	**100.00 %**

From the TMDL (2004)

Land Use in Bayou Verret, Bayou Chevreuil, Bayou Citamon and Grand Bayou

6.0 SOURCES OF NONPOINT SOURCE POLLUTION

6.1 Agriculture

Sugarcane is the dominant crop grown in the watershed and it is situated along the higher elevations as are the paved roads and residential areas. Farms are generally in a long, narrow strip with the homestead situated along the highway in "front". Proper drainage is necessary for sugarcane production. Most farms have individual or group drainage systems. When there is flooding in low-lying areas of the watershed, drainage efficiency is likewise compromised in the higher elevations where sugarcane is cultivated. Crops may be damaged and harvest made difficult. Sugarcane yield will be hampered by poor drainage. The main channels of Subsegment 020101 may be inadequate to dispose of normal levels of rainfall runoff if sugarcane production is to be supported. Sufficient rainfall may raise water levels in the low areas and flood areas under cultivation.

Sugarcane fields are a common site in the watershed.

Crawfish farming is also found within the subsegment. Because these operations are not classified as Concentrated Aquatic Animal Production Facilities, their discharge is not regulated. Crawfish farms do impact water quality. However, their effects are likely not as great here as they are elsewhere in the state because there are fewer in Bayou Verret, Bayou Chevreuil and Bayou Citamon. When LDEQ visited the watershed in May 2005, only one farm was seen.

In a manner of speaking, crawfish farm discharge may be considered both a point-source and a nonpoint source of contamination. The discharge may emerge from a discrete conveyance or run off from a large impoundment. This operation was seen in Reach 5, where the Middle St. James Canal (not modeled) intersects Bayou Citamon.

6.2 Point Source Discharges

The TMDL document identifies seven National Pollutant Discharge Elimination System permits within subsegment 020101. These discharge to Bayou Verret, St. James Canal, and Bayou Chevreuil. However, none was included in the TMDL model. They are not included here.

6.3 Hydromodification

Hydrologic modifications are defined as those activities, which are designed to affect natural stream flow. These types of modifications include bank stabilization, channel alignments, dredging, locks and dams, levees, spillways, and impoundments. Dredging, channel modifications, and impoundments are the most serious contributors to the nonpoint source pollution problem.

Oil and gas lines are found throughout the watershed.

There has been quite a bit of channel improvement throughout the subsegment so that what is seen today is largely modified by man. This arose in the last century for both flood prevention and agricultural water management/drainage. There are canals crisscrossing the natural water bodies, throughout the subsegment. Many of the water bodies still in their natural channels are dredged periodically. There is also an extensive network of gas lines throughout.

Dredging, as well as some mining activities, are common in the watershed. This site was seen in Reach 7, a heavily impacted part of the watershed, at the junction of Bayou Chevreuil with the Upper St. James Canal. (The Upper St. James Canal was not included in the TMDL model.)

7.0 MAKING THE IMPLEMENTATION PLAN WORK

Because this subsegment is so sparsely populated, it may be beneficial to include it in efforts undertaken for other adjacent or nearby subsegments. The Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou watershed has very few residences and fewer commercial buildings. There is not a lot of inhabitable ground and this has curtailed any development. The watershed is mainly used by sportsmen.

In 1990, USEPA and the state of Louisiana formed a partnership to protect and improve the water quality and habitat within the Barataria-Terrebonne estuary complex. This partnership resulted in the creation of the Barataria-Terrebonne National Estuary Program (BTNEP) as one of the nation's 28 estuaries of national significance, which comprise EPA's National Estuary Program. BTNEP has done much to raise the profile of the area and educate the public on issues of concern.

7.1 Regulatory Authority

Federal Authority

Section 319 of the Clean Water Act (PL 100-4, February 4, 1987) was enacted to specifically address problems attributed to nonpoint sources of pollution. Its objective is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Sec. 101; PL 100-4), which instructs the Governor of each State to prepare and submit a Nonpoint Source Management Program for reduction and control of pollution from nonpoint sources to navigable waters within the State by implementation of a four-year plan (submitted within 18 months of the day of enactment).

State Authority

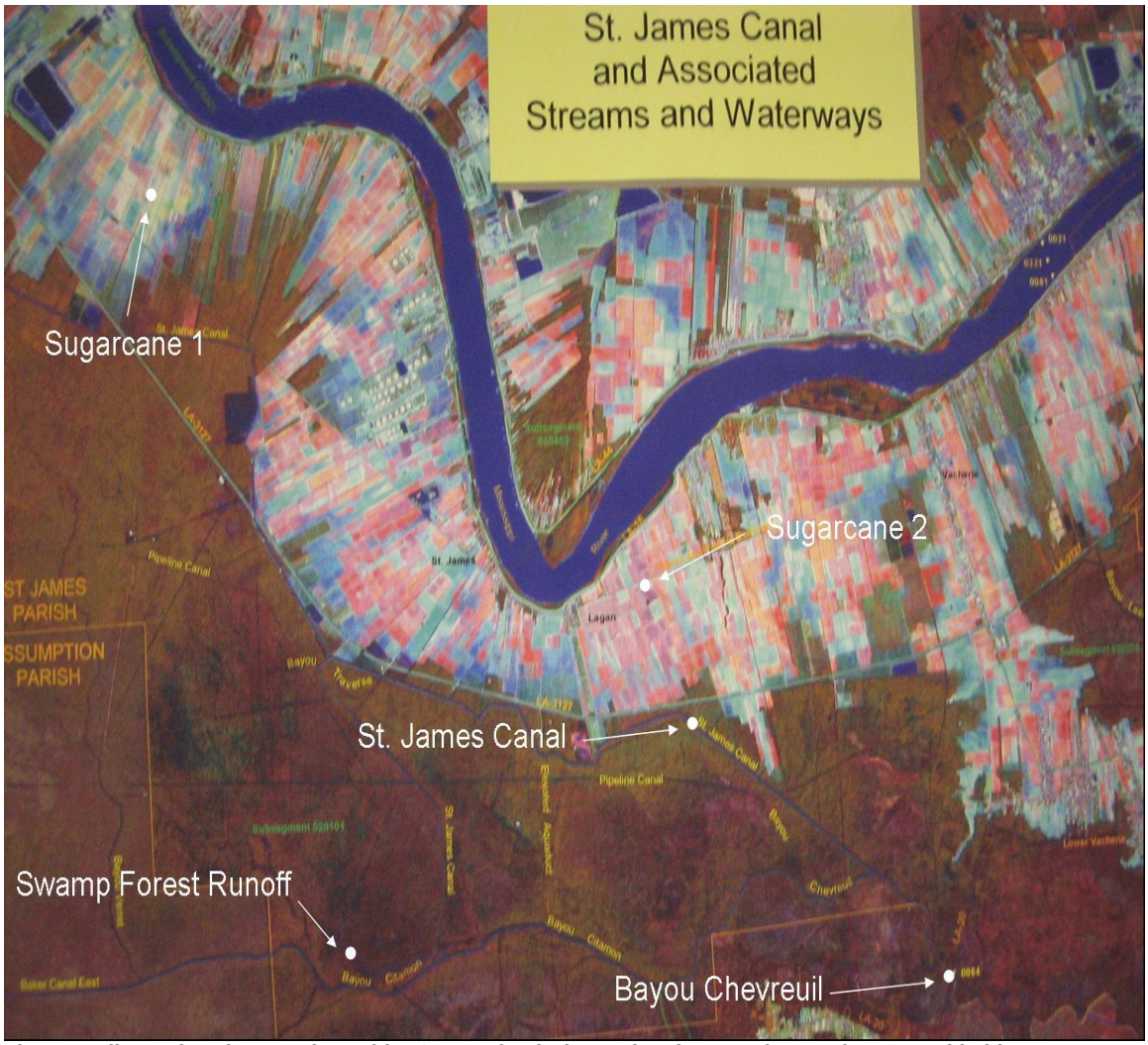
In response to the federal law, the State of Louisiana passed Revised Statute 30:2011, signed by the Governor in 1987 as Act 272. Act 272 designated the Louisiana Department of Environmental Quality as the "Lead Agency" for development and implementation of the State's Nonpoint Source Management Plan. The Louisiana Revised Statutes R.S. 30:201.D (20) include the following provision as the authority for LDEQ to implement the State's NPS Program:

To develop and implement a non-point source management and ground water quality protection program and a conservation and management plan for estuaries, to receive federal funds for this purpose and provide matching state funds when required, and to comply with terms and conditions necessary to receive federal grants. The nonpoint source conservation and management plan, the groundwater protection plan, and the plan for estuaries shall be developed in coordination with, and with the concurrence of the appropriate state agencies, including but not limited to, the Department of Natural Resources, the Department of Wildlife and Fisheries, the Department of Agriculture and Forestry and the State Soil and Water Conservation Committee in those areas pertaining to their respective jurisdictions.

7.2 Actions Being Implemented

LDEQ has worked with Louisiana State University on a project that addressed water quality issues associated with sugarcane runoff in the watershed. Runoff from two sugarcane fields was compared to a swamp forest site, a canal receiving runoff, and a water body further downstream from the receiving canal, where it was believed some assimilation would have occurred.

Water sampling equipment was installed at two locations adjacent to private sugarcane fields where runoff was received. Three additional sites were established for grab sample collection (see figure below). The three sites for grab samples were Bayou Chevreuil near the LA 20 bridge (site downstream from fields and representing assimilation of sugarcane runoff into water body), St. James Canal (receives runoff from sugarcane fields), and swamp drainage site east of Baker Canal (somewhat pristine swamp forest). Grab samples from these three sites were compared with samples taken from the two instrumented sites. TKN, NO_3^- and NO_2^-, Ammonia, Total P, PO_4^--P, TSS, and pesticides (the major spectrum) were analyzed.



Five sampling points from project with LSU, Wetland Biogeochemistry Institute. Figure provided by cooperator. This project ends April 15, 2007.

As expected, it was found that nutrients, suspended solids and pesticides from sugarcane runoff are entering water bodies of northern Barataria Basin. Water quality does improve as it moves further away from receiving ditches.

LDEQ has also worked with Louisiana Universities Marine Consortium (LUMCON) on an educational project geared to all water bodies in both Basins - Barataria and Terrebonne. The goal of this project was to increase awareness of teachers, students, and the general public about what nonpoint source pollution is (focusing on the two Basins), and what steps can be taken to reduce it. At the LUMCON main facility in Cocodrie, Louisiana, two standing kiosks were erected. Educational information is available on the two kiosks via touch-screen access. This information addresses nonpoint sources of pollution in the coastal zone. It also educates visitors about the implications of personal behaviors that may impact water quality.

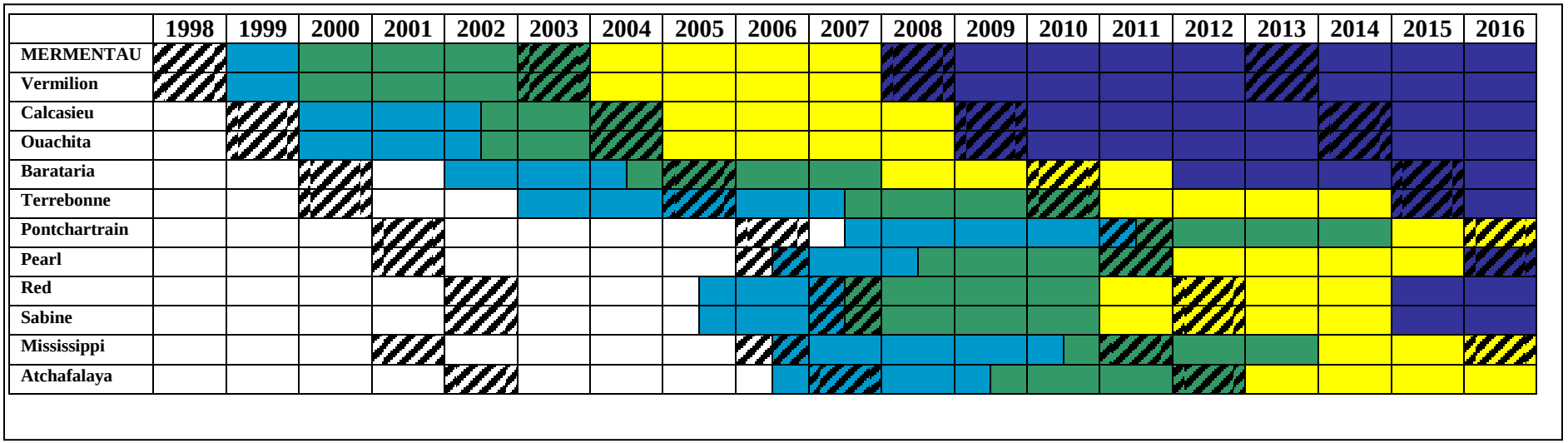
LDEQ worked with St. James Parish School Board to create and expand its Great River Camp Program. The camps on the west bank of the Parish primarily focused on subsegment 020101. Summer camps were held and young people learned about Nonpoint Source Pollution and ways they can help control it. A curriculum was developed that had environmental awareness as its focus. This was a “hands-on” method of instruction. Lessons were made enjoyable and the camp was free of charge to Parish youth.

Urban runoff and sugarcane field runoff may be two potential sources of pollutants in the watershed. Small towns and agriculture fields are concentrated along the high ground found on the north, south and west perimeters of the subsegment. From there, any runoff naturally flows towards the center of the subsegment, the low ground, where the main waterways flow. Because population density is so low in the watershed, there is no ordinance or requirement to develop and implement a storm water management program in any of the urban areas. Likewise, agriculture runoff is not regulated.

Several Best Management Practices (BMPs) have been developed that address these concerns. BMPs are defined as “practices, techniques, and measures that prevent or reduce water pollution from nonpoint sources by using the most effective and practicable means of achieving water quality goals” (Minnesota Pollution Control Agency). Voluntary adherence by local citizens in the inhabited areas of the subsegment would have a positive effect upon water quality in the more remote parts.

8.0 TIMELINE FOR IMPLEMENTATION

Timeline for Watershed Implementation



1- Dark Grey = Collect Water Quality Data to Develop the Total Maximum Daily Loads (TMDLs)
2- Turquoise = Develop the Total Maximum Daily Load for the Watersheds on the 303(d) list
3- Green = Develop Nonpoint Watershed Restoration Action Strategies
4- Yellow = Implement Nonpoint Watershed Restoration Action Strategies
5- Light Grey = Determine Whether Actions Have Been Successful in Restoring Designated Uses
6- Blue = Develop and Implement Additional Corrective Actions Necessary to Restore Designated Uses to the Water Body

Monthly Values for the Periods of Record

Station	Period of Record	Month	Parameter	Maximum	Median	Minimum
Bayou Chevreuil (0084)	1979 - 2004	January	Dissolved Oxygen	7.6	3.8	0.3
Bayou Chevreuil (0084)	1979 - 2004	February	Dissolved Oxygen	7.3	5.0	3.0
Bayou Chevreuil (0084)	1978 - 2004	March	Dissolved Oxygen	8.2	3.3	1.3
Bayou Chevreuil (0084)	1978 - 2004	April	Dissolved Oxygen	4.7	2.2	0.2
Bayou Chevreuil (0084)	1978 - 2000	May	Dissolved Oxygen	4.9	1.7	0.2
Bayou Chevreuil (0084)	1978 - 2000	June	Dissolved Oxygen	6.0	1.9	0.8
Bayou Chevreuil (0084)	1978 - 2000	July	Dissolved Oxygen	5.9	2.1	0.8
Bayou Chevreuil (0084)	1978 - 2000	August	Dissolved Oxygen	4.1	1.9	0.6
Bayou Chevreuil (0084)	1978 - 2000	September	Dissolved Oxygen	5.5	2.3	0.3
Bayou Chevreuil (0084)	1978 - 1990	October	Dissolved Oxygen	3.6	2.3	1.7
Bayou Chevreuil (0084)	1978 - 1997	November	Dissolved Oxygen	6.6	2.7	0.1
Bayou Chevreuil (0084)	1978 - 2000	December	Dissolved Oxygen	5.2	2.9	0.4
Bayou Chevreuil (0084)	1980 - 2004	January	Total Phosphorus	0.8	0.3	0.2
Bayou Chevreuil (0084)	1979 - 2004	February	Total Phosphorus	0.6	0.3	0.2
Bayou Chevreuil (0084)	1978 - 2004	March	Total Phosphorus	0.6	0.3	0.1
Bayou Chevreuil (0084)	1978 - 2004	April	Total Phosphorus	0.6	0.4	0.2
Bayou Chevreuil (0084)	1978 - 2000	May	Total Phosphorus	2.1	0.3	0.2
Bayou Chevreuil (0084)	1978 - 2000	June	Total Phosphorus	0.5	0.3	0.2
Bayou Chevreuil (0084)	1978 - 2000	July	Total Phosphorus	0.7	0.3	0.2
Bayou Chevreuil (0084)	1978 - 2000	August	Total Phosphorus	0.6	0.3	0.1
Bayou Chevreuil (0084)	1978 - 2000	September	Total Phosphorus	0.8	0.4	0.2
Bayou Chevreuil (0084)	1978 - 1990	October	Total Phosphorus	0.4	0.2	0.2
Bayou Chevreuil (0084)	1978 - 1997	November	Total Phosphorus	0.7	0.2	0.1
Bayou Chevreuil (0084)	1978 - 2000	December	Total Phosphorus	0.4	0.3	0.2

Station	Period of Record	Month	Parameter	Maximum	Median	Minimum
Bayou Chevreuil (0084)	1980 - 2004	January	Nitrite + Nitrate	0.3	0.1	0.02
Bayou Chevreuil (0084)	1979 - 2004	February	Nitrite + Nitrate	0.8	0.1	0.02
Bayou Chevreuil (0084)	1978 - 2004	March	Nitrite + Nitrate	0.2	0.1	0.01
Bayou Chevreuil (0084)	1978 - 2004	April	Nitrite + Nitrate	2.2	0.05	0.01
Bayou Chevreuil (0084)	1978 - 2000	May	Nitrite + Nitrate	2.5	0.1	0.01
Bayou Chevreuil (0084)	1978 - 2000	June	Nitrite + Nitrate	1.4	0.07	0.01
Bayou Chevreuil (0084)	1978 - 2000	July	Nitrite + Nitrate	2.9	0.4	0.02
Bayou Chevreuil (0084)	1978 - 2000	August	Nitrite + Nitrate	1.5	0.2	0.02
Bayou Chevreuil (0084)	1978 - 2000	September	Nitrite + Nitrate	1.4	0.08	0.02
Bayou Chevreuil (0084)	1978 - 1990	October	Nitrite + Nitrate	1.6	0.04	0.01
Bayou Chevreuil (0084)	1978 - 1997	November	Nitrite + Nitrate	0.5	0.07	0.02
Bayou Chevreuil (0084)	1978 - 2000	December	Nitrite + Nitrate	0.5	0.07	0.01
Bayou Chevreuil (0084)	1979 - 2004	January	Chloride	114.0	24.0	6.3
Bayou Chevreuil (0084)	1979 - 2004	February	Chloride	64.2	26.3	14.2
Bayou Chevreuil (0084)	1978 - 2004	March	Chloride	462.0	20.0	6.0
Bayou Chevreuil (0084)	1978 - 2004	April	Chloride	87.0	42.0	8.0
Bayou Chevreuil (0084)	1978 - 2000	May	Chloride	530.0	22.0	3.0
Bayou Chevreuil (0084)	1978 - 2000	June	Chloride	911.0	24.0	12.0
Bayou Chevreuil (0084)	1978 - 2000	July	Chloride	65.0	14.0	6.0
Bayou Chevreuil (0084)	1978 - 2000	August	Chloride	732.0	24.0	12.0
Bayou Chevreuil (0084)	1978 - 2000	September	Chloride	1246.0	19.0	6.0
Bayou Chevreuil (0084)	1978 - 1990	October	Chloride	1103.0	27.0	14.0
Bayou Chevreuil (0084)	1978 - 1997	November	Chloride	410.0	32.0	12.0
Bayou Chevreuil (0084)	1980 - 2000	December	Chloride	438.0	26.0	13.0
Bayou Chevreuil (0084)	1979 - 2004	January	Sulfate	37.0	11.0	3.0
Bayou Chevreuil (0084)	1981 - 2004	February	Sulfate	23.0	13.0	3.0
Bayou Chevreuil (0084)	1978 - 2004	March	Sulfate	128.0	5.0	2.0
Bayou Chevreuil (0084)	1978 - 2004	April	Sulfate	24.0	4.0	1.0
Bayou Chevreuil (0084)	1978 - 2000	May	Sulfate	658.0	4.0	1.0
Bayou Chevreuil (0084)	1978 - 2000	June	Sulfate	108.0	7.0	4.0
Bayou Chevreuil (0084)	1978 - 2000	July	Sulfate	23.0	7.0	2.0

Station	Period of Record	Month	Parameter	Maximum	Median	Minimum
Bayou Chevreuil (0084)	1978 - 2000	August	Sulfate	68.0	11.0	5.0
Bayou Chevreuil (0084)	1978 - 2000	September	Sulfate	114.0	8.0	1.0
Bayou Chevreuil (0084)	1981 - 1990	October	Sulfate	146.0	8.0	3.0
Bayou Chevreuil (0084)	1982 - 1997	November	Sulfate	33.0	9.0	3.0
Bayou Chevreuil (0084)	1981 - 2000	December	Sulfate	43.0	17.0	4.0
Bayou Chevreuil (0084)	1984 - 1998	January	Mercury	0.3	0.2	0.05
Bayou Chevreuil (0084)	1984 - 1986	February	Mercury	0.8	0.2	0.2
Bayou Chevreuil (0084)	1985 - 2004	March	Mercury	0.5	0.2	0.001
Bayou Chevreuil (0084)	1981 - 1986	April	Mercury	1.0	0.4	0.1
Bayou Chevreuil (0084)	1984 - 1998	May	Mercury	0.9	0.2	0.05
Bayou Chevreuil (0084)	1983 - 2004	June	Mercury	0.2	0.2	0.002
Bayou Chevreuil (0084)	1984 - 1997	July	Mercury	1.0	0.2	0.05
Bayou Chevreuil (0084)	1982 - 1984	August	Mercury	0.5	N/A	0.2
Bayou Chevreuil (0084)	1984 - 2000	September	Mercury	0.8	0.2	0.05
Bayou Chevreuil (0084)	1983 - 1985	October	Mercury	2.2	0.8	0.2
Bayou Chevreuil (0084)	1983 - 1997	November	Mercury	0.3	0.2	0.05
Bayou Chevreuil (0084)	1984 - 2000	December	Mercury	0.3	0.2	0.05
Bayou Onion (408)	1963 - 1974	January	Dissolved Oxygen	10.0	1.8	0.3
Bayou Onion (408)	1963 - 1974	February	Dissolved Oxygen	8.6	2.7	1.4
Bayou Onion (408)	1963 - 1974	March	Dissolved Oxygen	6.9	3.0	0.1
Bayou Onion (408)	1963 - 1974	April	Dissolved Oxygen	5.7	2.0	0.3
Bayou Onion (408)	1963 - 1974	May	Dissolved Oxygen	4.5	2.0	0.2
Bayou Onion (408)	1963 - 1974	June	Dissolved Oxygen	3.7	2.5	0.4
Bayou Onion (408)	1963 - 1974	July	Dissolved Oxygen	8.0	3.2	0.3
Bayou Onion (408)	1963 - 1974	August	Dissolved Oxygen	9.0	3.6	1.6
Bayou Onion (408)	1963 - 1974	September	Dissolved Oxygen	4.0	3.1	0.3
Bayou Onion (408)	1963 - 1974	October	Dissolved Oxygen	6.6	1.4	0.7
Bayou Onion (408)	1963 - 1974	November	Dissolved Oxygen	5.0	1.5	0.4
Bayou Onion (408)	1963 - 1974	December	Dissolved Oxygen	2.6	1.7	0.2

Station	Period of Record	Month	Parameter	Maximum	Median	Minimum
Bayou Onion (408)	1963 - 1974	January	Chloride	124.0	27.5	8.0
Bayou Onion (408)	1963 - 1974	February	Chloride	230.0	30.0	6.0
Bayou Onion (408)	1963 - 1974	March	Chloride	81.0	23.5	10.0
Bayou Onion (408)	1963 - 1974	April	Chloride	145.0	22.0	7.0
Bayou Onion (408)	1963 - 1974	May	Chloride	1150.0	25.5	7.0
Bayou Onion (408)	1963 - 1974	June	Chloride	319.0	23.0	5.0
Bayou Onion (408)	1963 - 1974	July	Chloride	226.0	24.0	6.0
Bayou Onion (408)	1963 - 1974	August	Chloride	224.0	20.0	9.0
Bayou Onion (408)	1963 - 1974	September	Chloride	122.0	16.0	8.0
Bayou Onion (408)	1963 - 1974	October	Chloride	120.0	18.0	7.0
Bayou Onion (408)	1963 - 1974	November	Chloride	131.0	32.0	10.0
Bayou Onion (408)	1963 - 1974	December	Chloride	55.0	29.0	15.0
Bayou Onion (408)	1966 - 1974	January	Sulfate	53.0	16.0	7.0
Bayou Onion (408)	1966 - 1972	February	Sulfate	81.0	39.0	14.0
Bayou Onion (408)	1966 - 1973	March	Sulfate	82.0	37.0	1.0
Bayou Onion (408)	1966 - 1973	April	Sulfate	49.0	28.0	2.0
Bayou Onion (408)	1965 – 1973	May	Sulfate	54.0	23.5	1.0
Bayou Onion (408)	1965 - 1974	June	Sulfate	27.0	16.5	2.0
Bayou Onion (408)	1965 - 1974	July	Sulfate	53.0	16.0	1.0
Bayou Onion (408)	1965 - 1974	August	Sulfate	67.0	18.0	5.0
Bayou Onion (408)	1965 - 1974	September	Sulfate	41.0	15.0	3.0
Bayou Onion (408)	1965 - 1972	October	Sulfate	32.3	20.0	11.0
Bayou Onion (408)	1965 - 1974	November	Sulfate	68.0	43.0	6.0
Bayou Onion (408)	1965 - 1974	December	Sulfate	55.8	20.0	10.0